ON GRAPH-THEORETICAL APPROACH TO SOLUTION OF LARGE-SCALE OPTIMIZATION PROBLEMS [1]

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In this report the problem of solving a large-scale standard linear programming problem $\min cx : Ax = b,\ x \geq 0$ with sparse but unstructured constrain matrix A is considered. This problem is reformulated as the orthogonal projection problem on the feasible polyhedron and further on reduced to the the projection of a certain fixed point onto the convex cone generated by rows of matrix A.[1].

The projection problem becomes much easier if the constrain matrix is decomposed with the help of coloring problem for the graph of constraint connectivity. The vertexes of the graph of the same color will correspond to the set of structurally-independent constraints, and projection onto such set has linear complexity with respect to the cardinality of this set. At the same time the number of such sets is not too large due to the sparsity of the original problem. Despite the fact that the coloring problem is NP-hard [2], the numerous heuristics for finding for instance maximal independent sets can be used for its satisfactory solution [3].

The talk is devoted to the current state of the implementation of this approach with especial attention given to the coordination problem to link the subset projections and the applications of this approach in transportation modeling and logistics.

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